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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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08/902,133 07/29/97 FORBES

L 303.356US1

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MM21/0903

EXAMINER

WALLACE, V

ART UNIT	PAPER NUMBER
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2815

DATE MAILED:

09/03/98

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

## Office Action Summary

Application No. 08/902,133	Applicant(s) Forbes et al.
Examiner Valencia Martin Wallace	Group Art Unit 2815

Responsive to communication(s) filed on Jul 29, 1997

This action is FINAL.

Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

### Disposition of Claims

Claim(s) 1-27 is/are pending in the application.

Of the above, claim(s) 21-26 is/are withdrawn from consideration.

Claim(s) \_\_\_\_\_ is/are allowed.

Claim(s) 1-20 and 27 is/are rejected.

Claim(s) \_\_\_\_\_ is/are objected to.

Claims \_\_\_\_\_ are subject to restriction or election requirement.

### Application Papers

See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.

The proposed drawing correction, filed on \_\_\_\_\_ is  approved  disapproved.

The specification is objected to by the Examiner.

The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. § 119

Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

All  Some\*  None of the CERTIFIED copies of the priority documents have been

received.

received in Application No. (Series Code/Serial Number) \_\_\_\_\_.

received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\*Certified copies not received: \_\_\_\_\_.

Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

### Attachment(s)

Notice of References Cited, PTO-892

Information Disclosure Statement(s), PTO-1449, Paper No(s). \_\_\_\_\_

Interview Summary, PTO-413

Notice of Draftsperson's Patent Drawing Review, PTO-948

Notice of Informal Patent Application, PTO-152

-- SEE OFFICE ACTION ON THE FOLLOWING PAGES --

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## DETAILED ACTION

### *Specification*

**The title of the invention is not descriptive.** A new title is required that is clearly indicative of the invention to which the claims are directed. The following title is suggested:  
Dynamic Electrically Alterable Programmable Read Only Memory device.

**The disclosure is objected to because of the following informalities:** The application numbers and/or patent numbers of the commonly assigned applications are missing.  
Appropriate correction is required.

### *Claim Objections*

**Claim 18 is objected to because of the following informalities:** the period is missing at the end of line 14. Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

**Claims 11 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

Claim 11 recites the limitation "the source and drain regions" in line 13. There is

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insufficient antecedent basis for this limitation in the claim.

Claim 19 recites the limitation "the intergate insulator" in line 16. There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371© of this title before the invention thereof by the applicant for patent.

**Claims 1-5, 7-14, 16-18, 20 and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by Forbes (U.S. Patent No. 5,740,104).**

Forbes discloses a memory cell, comprising:

a storage (floating) electrode (14) for storing charge;

a source region (20);

a drain region (22);

a channel region between the source region and drain region; and

an insulator adjacent to the storage electrode, wherein a barrier energy between the

insulator and the storage electrode is less than approximately 3.3 eV. Note Forbes Figure 2.

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In re claims 2 and 12, materials comprising at least one of the storage electrode and the insulator are selected to have an electron affinity causing the barrier energy to be selected at less than approximately 3.3 eV (see Forbes column 3, lines 29-37).

In re claims 3-5, 13 and 20, Applicants are reminded that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In a claim drawn to a process of making, the intended use must result in a manipulative difference as compared to the prior art. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963).

In re claims 7 and 16, the storage electrode comprises a material that has a material composition that is selected to obtain a smaller electron affinity than polycrystalline silicon (see Forbes column 3, lines 29-37).

In re claim 8, it is inherent to the structure and the combination of materials that the memory device of Forbes will have a barrier energy less than approximately 2.0 eV.

In re claims 9 and 14, the storage electrode is isolated from conductors and semiconductors (see Forbes column 3, lines 20-23).

In re claim 10, the storage electrode is transconductively capacitively coupled to a channel (see Forbes Figure 2).

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In re claims 17 and 18, Forbes further discloses a control electrode (16) separated from the floating gate by an intergate dielectric (28), wherein the area of a capacitor formed by the control electrode, the floating gate and the intergate dielectric is larger than the area of a capacitor formed by the floating gate, the insulator and the channel region. Note Forbes Figure 2.

Therefore, Forbes meets and anticipates the claims.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 6 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forbes in view of Aoyama et al. (U.S. Patent No. 4,507,673).**

The disclosure of Forbes as discussed above. However, Forbes fails to provide a gate insulating layer of silicon carbide.

Therefore, to provide the device of Forbes with a gate insulating layer of silicon carbide rather than a floating gate of silicon carbide such as taught by Aoyama et al. would have been obvious to one of ordinary skill in this art because Aoyama et al. teach forming a gate insulating layer (5) of silicon carbide in contact with a floating gate (7) to reduce the gate voltage to the minimum necessary for writing and clearing data.

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***Allowable Subject Matter***

**Claim 19 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2<sup>nd</sup> paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.**

The following is a statement of reasons for the indication of allowable subject matter: the prior art references fail to teach, disclose or suggest, either alone or in combination, a memory device having an intergate dielectric having a permittivity higher than a permittivity of silicon dioxide formed between a floating gate and a control gate.

***Conclusion***

**The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.** The references to Horiuchi et al. (U.S. Patent No. 4,769,686), Yamazaki et al. (U.S. Patent No. 5,449,941), Yamazaki et al. (U.S. Patent No. 5,629,222) and Forbes (U.S. Patent No. 5,754,477) are cited to show semiconductor devices similar in structure to that of the present invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Valencia Martin Wallace whose telephone number is (703) 308-4119. The

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examiner can normally be reached on Monday - Thursday from 8:00 a.m. to 5:00 p.m. The fax phone number for this Technology Center is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.

*Valencia Martin Wallace*  
**Valencia Martin Wallace**  
**Primary Examiner**  
**Technology Center 2810**

Martin Wallace  
August 28, 1998